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Tephromela follmannii (lichenized *Ascomycota*), a new species from the Canary Islands

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Abstract—*Tephromela follmannii*, found on basaltic rocks on the Canary Islands, is described as new to science. A description of the species is provided, together with notes on its chemistry, distribution, ecology, and taxonomy. Possible related taxa are discussed briefly.

Key words—biodiversity, Macaronesia

Introduction

The Canary Islands form part of Macaronesia, one of the world's biodiversity hotspots (Myers et al. 2000). The diverse lichen flora of the islands has more than 1500 species in an area of just 7447 km^2 (Hafellner 1995, 1999, 2002, 2005, 2008), and new species are still being discovered at frequent intervals (e.g. Elix & Schumm 2003, van den Boom & Vězda 2005, Pérez-Vargas et al. 2007, 2010a,b, Pérez-Vargas & Pérez de Paz 2009). In the present work we describe a new species of *Tephromela*.

The lichen genus *Tephromela* M. Choisy was resurrected by Hafellner to accommodate several species previously assigned to *Lecanora* (the *L. atra* s.l. complex), primarily on the basis of ascus structure, and placed in a new family, *Tephromelataceae*, within the *Lecanorales* (Hafellner 1984). However, the familial affiliation of this genus is unresolved, as recent molecular studies were inconclusive in deciding whether *Tephromela* should be included in the *Tephromelataceae* or assigned to the *Mycoblastaceae* (Miadlikowska et al. 2006, Arup et al. 2007). The genus includes approximately 40 species with arctic/alpine and temperate distributions in Australasia, Asia, Europe and

North America, and centers of speciation in tropical regions (Nash et al. 2004). *Tephromela follmannii* is closely related to the type species, *T. atra* (Huds.) Hafellner. However, the genus has not been monographed and some European morphotypes of *T. atra* remain poorly understood, as is the delimitation of *T. atra* from some extra-European species (Hafellner 2007). The lecideoid species were recently transferred to *Calvitimela* Hafellner on the basis of the ascomata and ascus type (Hafellner & Türk 2001). *Tephromela* is characterized by a poorly developed true exciple, the dark violaceous hymenium, *Bacidia*-type asci, simple or sparingly branched paraphyses and the occurrence of moniliform conidiogenous cells (Hafellner 1984, Nash et al. 2004).

Materials and methods

The morphology of the lichen specimens was examined using a Leica ZOOM 2000 or a Zeiss Stemi 2000C stereo-microscope. Sections for anatomical examination were cut by hand and mounted and observed in water. Anatomical structure and hymenial characters were studied with an Olympus CH light microscope. Chemical constituents were identified by thin layer chromatography using solvent systems A [benzene:dioxane: acetic acid, 180:45:5], B [hexane:methyl *tert.*–butyl ether:formic acid, 140:72:18] and C [toluene:acetic acid, 85:15] (Culberson 1972, Culberson & Johnson 1982, Elix & Ernst-Russell 1993), high performance liquid chromatography (Elix et al. 2003) and comparison with authentic samples. Specimens are deposited in TFC and CANB.

The species

Tephromela follmannii Pérez-Vargas, Hern.-Padr. & Elix, sp. nov. Fig. 1

MycoBank MB 515344

Tephromelae atrae *similis sed thallo crassiore, hymenium profundis et materia chimica differt. Thallus saxicola, albidus vel cremeus, 0.8–1.2 mm crassus. Apothecia usque ad 2(–3) mm in diametro, sessilia, margine thallino circumdata. Hymenium 150–180(–200) µm altum, violaceum. Asci clavati 60–65 × 10–15 µm, typum* Bacidia. *Ascosporae octonae, ellipsoideae, 10–11 × 6–7 µm. Materia chimica: atranorinum, acidum β-alectoronicum, acidum alectoronicum, acidum α-collatolicum, acidum β-collatolicum, acidum physodicum, acidum 4-O-methylphysodicum et substantia ignota.*

Type— Spain, Canary Islands, Tenerife, "Tiro del Guanche", El Teide National Park, on basaltic rocks, UTM: 334317/ 3122460, 2050 m alt., August 2006, C. Hernández & P. L. Pérez, TFC Lich: 6219 (TFC Lich-**holotype,** CANB-isotype).

Etymology— The new species is named in honour of the German lichenologist, Prof. Dr. Gerhard Follmann, in recognition of his many contributions to Canarian lichenology and for his friendship.

Thallus saxicolous, areolate-bullate to verrucose, whitish to cream-coloured, 0.8–1.2 mm thick, lacking isidia and soredia. Cortex 15–25 µm thick, algal layer c. 40–60 µm thick; algal cells 10–12 µm wide; medulla white. Apothecia common, sessile, up to 2(–3) mm wide; disc concave or plane to slightly convex,

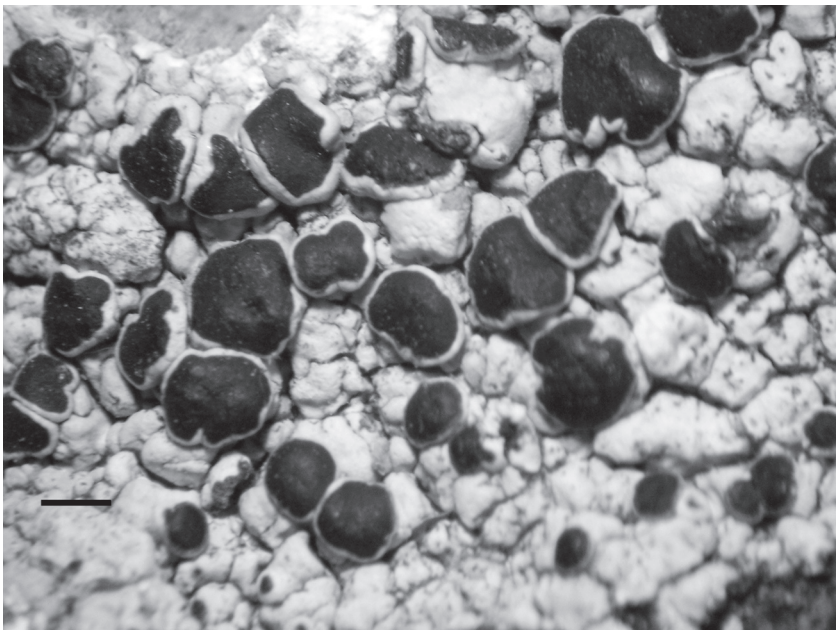

Fig. 1. *Tephromela follmannii*, part of holotype. Scale = 1 mm.

round, black, glossy and epruinose; thalline exciple prominent, persistent, smooth to folded over the disc, 180–225 µm wide; true exciple not apparent. Epihymenium dark violet; hymenium 150–180(–200) µm high, violet, I+ blue; subhymenium hyaline, 25–30 µm thick, hypothecium yellow-brown, 75–100 µm thick. Paraphyses stout, not or sparingly branched, mostly not anastomosing, 5–6 µm thick below (lumina c. 2 µm wide), 8–9 µm thick apically (lumina c. 3.5 µm wide). Asci of *Bacidia*-type, 8-spored, 60–65 × 10–15 µm. Ascospores ellipsoid, colourless, 10–11 × 6–7 µm. Pycnidia not seen.

Chemistry— Atranorin (minor), β-alectoronic acid (minor or major), alectoronic acid (major or minor), α-collatolic acid (minor), β-collatolic acid (minor), physodic acid (trace), 4-*O*-methylphysodic acid (trace), unknown (minor).

Ecology— *Tephromela follmannii* occurs on basaltic rocks on four of the Canary Islands. It exhibits considerable ecological plasticity but it appears to prefer moderate to high elevations. On Tenerife it was collected in the mountains of Teide National Park at 1900–2050 m, in "retamar", a montane shrub-dominated community. Phytosociologically this community belongs to *Spartocytisetum supranubii* Oberd. ex Esteve (Martín Osorio et al. 2007), with *Spartocytisus supranubius*, *Pterocephalus lasiospermus* and pine (*Pinus*

canariensis) reafforestation. On La Palma *T. follmannii* grows at 550–2450 m in a *Pinus canariensis* forest (*Loto hillebrandii-Pinetum canariensis,* A. Santos) or in the high mountain in "codesar" (*Genisto benehoavensis-Adenocarpetum spartioidis* A. Santos (Del Arco Aguilar 2006)), with *Adenocarpus viscosus* subsp. *spartioides*, *Genista benehoavensis* and sporadically *Spartocytisus supranubius*, *Descurainia gilva,* or *Viola palmensis*. We have also collected this species on Gran Canaria at over 1000 m in a *Pinus canariensis* forest. Finally, on La Gomera *T. follmannii* was collected at 1100–1200 m alt., in an old pine plantation (*Pinus canariensis* and *P. radiata*) with *Erica arborea*, *Adenocarpus foliolosus*, *Chamaecytisus proliferus* and *Cistus* spp.

Additional specimens examined— **SPAIN, Canary Islands, Tenerife**: "El Boquete", El Teide National Park, on basaltic rocks, UTM: 335005/3121230, 2100 m alt., February 2006, C. Hernández & P. L. Pérez, TFC Lich: 6510 (duplicate in CANB); "Los Areneros", El Teide National Park, on basaltic rocks, UTM: 335330/3131162, 1900 m alt., August 2007, C. Hernández & P.L. Pérez, TFC Lich: 9025; **La Palma**: "Inmediaciones del Pico de Piedra Llana", Caldera de Taburiente National Park, on basaltic rocks, UTM: 222792/ 319279, 2320 m alt., November 2001, C. Hernández & P.L. Pérez, TFC Lich: 5311 (duplicate in CANB); "Cauce del barranco del Huanahuao", Caldera de Taburiente National Park, on basaltic rocks, UTM: 219650/ 317899, 550 m alt., January 2001, E. Muñoz & A Rebolé, TFC Lich: 3345; **Gran Canaria**: "Camino de Faneque, ca. Tamadaba", Pinar de Tamadaba, on basaltic rocks, 1000 m alt., April 1976, B. Méndez, TFC Lich: 118; **La Gomera**: "Laderas sobre Erquito", Garajonay National Park, on basaltic rocks, UTM: 277609/3111281, 1125 m alt., September, 2001, C. Hernández & P.L. Pérez, TFC Lich: 5035 (duplicate in CANB).

Discussion

The saxicolous *T. follmannii* is characterized by its thick, greyish cream, areolate-bullate to verrucose thallus, large, black apothecia, a thick hymenium, and by its complex chemistry.

This new species appears to be closely related to *T. atra*, and while it can resemble some well-developed saxicolous specimens of that species, it can be distinguished by the thicker verrucose thallus (0.8–1.2 mm vs. 0.3–0.5 mm thick), the thicker hymenium (150–200 µm vs. 50–60 µm), and more complex chemistry.

Morphologically, *T. follmannii* resembles the Australian *T. stenosporonica* Elix & Kalb, but the latter has a different chemistry, with the substitution of stenosporonic and colensoic acids for the depsidones present in most species of this group (α-collatolic and alectoronic acids). In addition, *T. stenosporonica* has white pruina along ridges and margins of the areolae (Elix & Kalb 2006).

Tephromela priestleyi (C.W. Dodge) Øvstedal, from Antarctica, has a similar hymenium, asci, and ascospores to *T. follmannii,* but it has a squamulose-placodioid thallus, larger apothecia (up to 3.5 mm wide), and simple chemistry (containing only atranorin) (Øvstedal & Lewis Smith 2009).

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